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6. AUTHOR(S)
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13. ABSTRACT *(Maximum 200 words)*

Interactive visualization allows scientists and engineers to analyze massive data sets in new ways. They can prune useless data,identify important features, and see the science behind the data. We address computational tasks of image generation, dynamical visualization, and interactive manipulation and quantitative querying. The data sets comprise of scalar fields (volumetric histological scans of spinal cord injuries), vector fields (numerical simulation of turbulent flows) and tensor fields (Reynolds stresses produced by vortices in the flow). Image generation is the core of visualization. Dynamical visualization brings out time dependent features that are hard to recognize in static images. Interactive manipulation and querying allows users to focus and quantify key features in large datasets.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Vector Fields, Visualization, Quantiative Querying	3
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Technical Progress Report
(01 January 97 - 30 September 97)

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7. Project Title: Visualization and Querying of Scalar, Vector and Tensor Field Data

8: Grant No: F49620-97-1-0278

9. Web pages that provide project descriptions:
URL: http://www.cs.purdue.edu/research/shastra/projects/visualization/shaviz.html

10. Objectives:

Interactive visualization allows scientists and engineers to analyze massive data sets in new ways. They can prune useless data, identify important features, and see the science behind the data. We address computational tasks of image generation, dynamical visualization, and interactive manipulation and quantitative querying. The data sets comprise of scalar fields (volumetric histological scans of spinal cord injuries), vector fields (numerical simulation of turbulent flows) and tensor fields (Reynolds stresses produced by vortices in the flow). Image generation is the core of visualization. Dynamical visualization brings out time dependent features that are hard to recognize in static images. Interactive manipulation and querying allows users to focus and quantify key features in large datasets.

11: Project Status:

Visualization research has been considerably enhanced with the acquisition of the high performance graphics workstation. Paper [2] deals with quantitative visualization of spinal cord injuries, paper [8] with macromolecular visualization, paper [10] with a novel graphical user interface for both scalar and vector data visualization and paper [11] on soon to be completed work on collaborative interfaces and computational steering of turbulent flow simulations on the Intel Paragon supercomputer.

12. a. Number of AFOSR supported:

i. Papers published or accepted for publication in refereed journals: _3
ii. Papers published or accepted for publication in refereed conferences: _4
iii. Books or book chapters published or in press: __3

b. Trainee Data: Total 8 Female 2 Male 6
Minority 0 Non Us Citizen 5

i. No. of Grad Students 6
ii. No. of Postdoctorals 0
iii. No. of Undergraduates 1

c. Number, cost and description of equipment items costing more than $1000 that were purchased on your AFOSR grant.

Silicon Graphics Onyx2 Rack System with 2xR10K processors, Infinite Reality Graphics Board with 2 Raster Managers with 64MB Texture memory, 256MB RAM, 9.1.GB disk.

e. Awards/Honors to PI and/or members of PI's research group (please describe).

Awarded Visualization Chair, e University of Texas at Austir
Austin, TX.

Appointed Director of the Visualization Research Center with the Texas Institute of Computational and Applied Mathematics (TICAM), The University of Texas at Austin.

f. Brief description of all transitions (or intended transitions) of your ideas or techniques to industry, to military laboratories or to military application.

Transition of Dynamic Mesh Simplification, Compression and Visualization Techniques to the Institute of Defense Analysis, Arlington, VA.

g. Attach list of papers and other publications with full citation.

[1] ''Sliced Configuration Spaces'',
(with E. Sacks).
Full version accepted for publication in {International Journal Of Robotics Research}, (1997).

[2] ''Rational Parameterizations of Nonsingular Cubic Surfaces'',
(with R. Holt and A. Netravali).
Full version accepted for publication in {ACM Transactions on Graphics}, (1997).

[3] ''Two and Three Dimensional Computer Graphic Evaluation of the Subacute Spinal Cord Injury'',
(with L. Moriarty, B. Duerstock, K. Lin, and R. Borgens).
Full version accepted for publication in {Journal Of Neurological Sciences}, (1997).

[4] Book: {\sf Scientific Visualization Techniques}, John Wiley and Sons, (1997)

[5] ''Splines and Geometric Modeling'',
(with S. Evans)
{CRC Handbook of Discrete and Computational Geometry},
edited by J. Goodman and J. O'Rourke,
CRC Series, {Discrete and Combinatorial Mathematics},
(1997), 833 - 849.

[6] Book Chapter: ''Implicit Surface Patches'',
{Introduction to Implicit Surfaces}, edited by J. Bloomenthal,
{Morgan Kaufman Publishers}, (1997), 98 - 125.

[7] ''Interrogative Data Visualization'',
(Invited Paper at the 7th IMA Conference on the Mathematics of Surfaces),
{The Mathematics of Surfaces VII},
edited by T.N.T. Goodman and R. Martin, {Oxford University Press},
(1997).

[8] ''NURBS based B-rep Models for Macromolecules and their Properties'',
(with H-Y. Lee, R. Merkert, V. Pascucci),
{Proc. of the 1997 ACM Symposium on Solid Modeling},
ACM Press, (1997), Atlanta, Georgia, 217 - 228.

[9] ''Contour Trees and Small Seed Sets for Isosurface Traversal'',
(with M. van Kreveld, R. van Oostrum, V. Pascucci, D. Schikore)
{Proc. of the 13th Annual ACM Symposium on Computational Geometry},
ACM Press, (1997), Nice, France, 212 - 219.

[10] ''The Contour Spectrum'',
(with V. Pascucci, D. Schikore)
(Proc. of the Annual IEEE Visualization Conference),
IEEE Computer Society Press, (1997), Phoenix, Arizona.

[11] ''Collaborative Visualization and Steering of Turbulent Flow Simulations"
(with G. Blaisdell, S. Cutchin, H. Qin, R. Schikore)
(Manuscript), 1997.

h. List of Invited Presentations

Dagstuhl-Seminar on Scientific Visualization, Schloss Dagstuhl, West Germany, May 1997.

Minisymposium on Reverse Engineering, Conference on Computer Aided Geometric Design, Lillehammer, Norway, July 1997.

IMACS conference on Problem Solving Environments Berlin, Germany, August 1997.

Invited Speaker at the Laredo Course on Applications of Symbolic Computing, Laredo, Spain, September 1997.

Invited Speaker for a Tutorial at Eurographics '97, Budapest, Hungary, September 1997.

Invited Speaker for the Conference on New Themes in Computer Aided Geometric Modeling, Tel-Aviv, Israel, February 1998

Invited Speaker at the Mathematisches Forschungsinstitut Oberwolfach Seminar on Free-Form Curves and Surfaces, West Germany, June 1998.

i. List of Program Committees Served

Pacific Graphics '97, Korea, 1997

Computer Graphics International '97, Belgium, 1997.

Workshop on Algorithms and Data Structures '97, WADS, Halifax, Canada 1997.

Program Committee Member of the IEEE Visualization Conference '97, Phoenix, Arizona, October 1997.

Program Committee Member of Fifth International Conference on Computer-Aided Design and Computer Graphics, Shenzhen, China, December 1997.

Program Committee Member of the ACM symposium on Computational Geometry (Theory) Minneapolis, MN, June 1998.

Program Committee Member of IMA Math of Surfaces VIII, Birmingham, UK, August 1998.